AVIATION

The Oldest American Aeronautical Magazine

FEBRUARY 4, 1924 **Issued Weekly** **PRICE 10 CENTS**

U. S. naval flying boat at anchor in a lagoon on the east coast of Nicaragua

Official Photo, U. S. Navy

VOLUME XVI

NUMBER 5

SPECIAL FEATURES

THE BEAUMONT CUP REGULATIONS
REVIEW OF NEW AIRCRAFT INSTRUMENTS
DESCRIPTION OF A COMMERCIAL SEAPLANE BASE
RECENT PROGRESS IN ITALIAN AIRSHIP CONSTRUCTION

THE GARDNER, MOFFAT CO., INC.
HIGHLAND, N. Y.
225 FOURTH AVENUE, NEW YORK

Entered as Second-Class Matter, Nov. 22, 1920, at the Post Office at Highland, N. Y. under Act of March 3, 1879.

CURTISS-REED ONE-PIECE DURALUMIN PROPELLER

Since the earliest days of flying, one of its greatest hazards has been the uncertainty and frailness of wooden propellers.

Serious accidents constantly result from the effect on wooden propellers of:

- Climatic conditions,
- Hail, rain, tall grass and small particles encountered in cross country flying,
- Spray on seaplane propellers,
- Failures of the propeller tips, due to centrifugal forces,
- Damage through handling and storing

THESE HAZARDS ARE ENTIRELY REMOVED IN THE CURTISS-REED ONE-PIECE DURALUMIN PROPELLER

WHICH, IN ADDITION, IS THE MOST EFFICIENT PROPELLER THAT HAS EVER BEEN TESTED

PROOF

The winning 1923 Navy Curtiss Pulitzer and Schneider Cup entries were equipped with Curtiss-Reed propellers.

Revolutions per minute of upwards of 3,000 were repeatedly attained while establishing the new world's speed record of 266 miles per hour.

Curtiss-Reed propellers which have been in continuous cross country service for over two years are as good today as when installed.

Metal Propellers Have Been Talked Of For Years. They Are Now Available.

STANDS FOR SPEED WITH SAFETY

CURTISS AEROPLANE & MOTOR COMPANY, Inc.

GARDEN CITY, N. Y.

FACTORIES AT GARDEN CITY, N Y. and BUFFALO N Y

Flying School at Garden City, N. Y.

For Winter Training and Flying Write—
The Curtiss-Florida Aviation Camp, at Miami Fla.

Southwestern Station, Love Field, Dallas, Texas—
Training Throughout the Year

Overcoming Cold Weather Handicaps

TWENTY years ago, only a few far-sighted men realized the possibilities of transportation by air. There was then no thought of an aviation industry. The Wright Brothers' flight at Kitty Hawk of 59 seconds was considered remarkable. No one even imagined that mail would one day be carried by airplane from New York to California in twenty-six hours.

Now the situation is very much different. All but a few skeptics agree that aviation is fast developing to the point where aircraft will soon compete profitably with other means of transportation.

But before this competition can be attempted, it is essential, among other things, that service be rendered regardless of the weather conditions.

Cold weather is one of the main handicaps to continuous service. But just as the automobile industry overcame this difficulty, so can the aviation industry overcome it.

Engine lubrication trouble has been one cause of this cold weather handicap. Many ships have exposed oil piping. For flying in low temperatures these require a special oil which will withstand the congealing effects of the cold and still resist high bearing pressures.

Superla Aero Oil (Winter)

has been developed by us particularly for flying in low temperatures. It gives you ideal lubrication under these conditions. As are all Standard Lubricants, it is made from crude oils especially selected for their lubricating qualities. It is refined with painstaking care. Into this refining enters the experience of the Standard Oil Company (Indiana), an experience covering over a third of a century in supplying lubricants for every conceivable type of engine and machine. Those flyers using Superla Aero Oil (Winter) find that it absolutely eliminates cold weather lubricating trouble.

You can obtain Superla Aero Oil (Winter); Stanolind Aviation Gasoline and Stanolind Aero Oils at many landing fields conveniently located throughout the mid-western territory served by this company. A list of these fields is contained in our booklet "PLANE FACTS," a copy of which will be sent you on request.

STANDARD OIL COMPANY
(INDIANA)

910 S. Michigan Avenue CHICAGO, ILLINOIS

Publisher's News Letter

The lighter-than-air field of aeronautics has always been more of a problem than the heavier-than-air branch of aircraft development. The progress that has been made in airships has seemed to follow no definite plan of expansion. Airships, whether small or large, rigid or nonrigid, built of metal, fabric or of wood—all have been built without thought of a continuous program. Possibly this has largely been due to the indefinite nature of the uses to which this type of aircraft can be put.

The optimists have insisted on the certain financial success of the large airships, and have built around it a prospective commercial future that has appealed to the imagination of the public.

* * * *

As far back as anyone in aeronautics can remember, the stock offerings of some of the typical airship promoters that have followed one another with regularity have always been emphasizing the commercial future of lighter-than-air transport. The pictorial element in connection with these offerings has been alluring in its imaginative portrayal of air travel. Many credulous investors have been attracted by these mostly impractical venturm, and after a time no more was heard of the projected airship lines that were to be put in operation between our larger cities. Perhaps it is because of the unbusinesslike methods of these promoters that airship progress has been so slow.

* * * *

The present situation in this field is more promising. The Goodyear group, with its Zeppelin affiliations, the American Investigation Corporation with its Schuette-Lanz connections, and the Upson group in Detroit as the pioneer of an original American design, all appear to be considering airship transportation as a serious industrial and commercial enterprise rather than as a stock promotion scheme. Two other organizations, the Connecticut and the Hammondsport groups, are also conducting lighter-than-air activities. With so much talent concentrated on the problems, and with the best field for airship operation available in this country, this branch of aeronautics in a few years time ought to begin to show some definite signs of life.

* * * *

Probably no other aeronautical publication in the world has done as much as AVIATION to keep its readers adequately informed of the advance of airship engineering. An article printed in this issue is but another proof of it. While having some definite opinions as to the utility of airships for passenger and freight transportation, an open mind has been turned toward all endeavors in this line with the hope of learning of a really profitable plan which would bring the airship into a legitimate sphere of aerial activity. Airship people have, as a rule, been so ambitious in their projects that none have seemed capable of reaching the starting point of their enterprise, though from some of the publicity appearing in the press the most elaborate of these schemes always seemed imminent in its execution.

With the past in mind, it is to be hoped that in the future there will be less imagination and more practical progress in the lighter-than-air field. The airship, just as the airplane, can only be "sold" to the public by actual demonstration. The airplane is in a fair way to reap the benefits of this day in day out demonstration. The airship has yet to make the grade.

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Looking at the Calendar

THE Calendar of Aeronautical Events which appears again with this issue of AVIATION, now that the flying season draws near in the northern latitudes, is worth more than a cursory glance.

Taking the principal international events one by one, and remembering America's standing in each category of aircraft, a few pertinent remarks suggest themselves to the observant reader.

Starting with the oldest type of aircraft extant, the free balloon, the Gordon Bennett Balloon Cup race reminds us of the gratifying fact that American balloonists won this international classic four times. Had they but won it three times in succession, the Cup would have become America's permanent property. But our past performances in international ballooning contests give sufficient ground for the hope that the famous Cup may yet come into America's possession.

In the matter of balloon records our standing is not so high. German balloonists hold everyone of the three recognized balloon records for maximum capacity—altitude, distance and duration. In this connection AVIATION can but repeat what it has said for two years past, namely, that the Army and the Navy Air Services should endeavor to bring these lighter-than-air craft records to America—just as they have done in the case of airplane records.

In high speed airplane events our superiority—as shown by the Pulitzer Trophy races—has not been seriously challenged for the past two years. Hence it is to be expected that France, England and Italy will, this year, do their utmost to carry the Pulitzer Trophy across the seas. The same remark applies to the Schneider Cup, which our naval aviators won for the first time last fall.

It must be realized by those who perhaps look askance upon the expenditure involved in preparing international speed races, that victory in these events exerts a world wide influence upon the aeronautical market. When Italian machines have been winning the Schneider Cup race year after year, the directors of military air services and the pilots of the countries which lack an aircraft industry quite naturally received the impression that Italian seaplanes were far superior to all others. As a result Italian manufacturers received orders for seaplanes from Scandinavia, Switzerland, Spain, South America and other regions. When an American plane goes abroad and beats the whole European coalition, it advertises the fact to those same air officers that we have something that performs better than anything Europe can produce. But one such victory is not sufficient to eradicate past sympathies and affiliations. The victory must be repeated to bring about practical results in the form of government orders. Hence we hope that our technical preparation for this year's Pulitzer and Schneider Cup races will be of the most thoroughgoing kind.

Another valuable reminder the Calendar of Aeronautical Events furnishes is the fact that so far only vague and valiant hopes have been expressed with regard to holding an American light plane meet the coming season. Our backwardness in this line of aeronautical progress is best exemplified by the fact that next summer there will take place in France a cross country race of several hundred miles' length restricted to low powered airplanes. The answer is that France has got not one but half a dozen light planes with which to race, while we have nothing in the air as yet. In fact, we have neither any glider that can perform like some of the best French and German gliders, the very machines which made possible the development of high performance light planes. And the reason we have no gliders is that no incentive was offered during the past two years to American glider enthusiasts to spend some energy and money on this type of aircraft.

This field, then, is the one where we are sadly deficient. Some liberal monetary rewards would be required to bring us up to date with the rest of the world in the field of gliders and light planes.

While this field offers less of a spectacular appeal than high speed races, the light plane appears to be such a promising development toward more economical and more efficient flight that we cannot afford to stand back and let Europe do all the development work.

Twenty Years Ago

THE NEW YORK TRIBUNE on January 24 reprinted from its issue of January 24, 1904, an interesting reminder of how at a comparatively recent date those who believed in flying were classed as visionaries.

To quote the notice: "Representative Robinson, of Indiana, in the House today attacked bitterly the War Department's policy in spending money to aid in the development of the Langley airship. He said the department had put $100,000 into a project 'which every sensible man knows has no utility.' He continued: 'Here is $100,000 of the people's money wasted on this scientific aerial navigation experiment because some man, perchance a professor, wandering in his dreams, was able to impress the officers that his aerial flight scheme had some utility!'"

And now, but twenty years later, the incredulity of Representative Robinson will be looked upon by most people with tolerant amusement.

There are probably today in aeronautics many projects that seem no less impracticable than Langley's "aerodrome" looked in 1903, but which in 1944 may be accepted as everyday routine.

The Beaumont Cup Race Regulations

International High Speed Event for 200,000 Francs in Prizes

AVIATION has received a copy of the translation of the rules under which the contest for the "Commodore Louis D. Beaumont Cup" The prize for this international speed contest amounts to 200,000 francs.

This Cup Race shall be held under the conditions fixed by the existing regulations, as promulgated by the Aviation Co Commission of the Aero Club of France, at the request of the donor and approved by him

Qualifications for Contestants and Pilots

Every duly qualified National Federation desiring to compete for the Cup should send to the Secretary of the Aviation Commission, 35 Rue Francois I, Paris, its entry accompanied by a sum of 5,000 Francs per airplane Of this sum 3,000 Francs shall be refunded if the airplane flies across the starting line

The contestants, from each nation, making the entries, shall be the constructors of the airplanes The entries can not be received unless they are presented by a National Federation affiliated with the Fédération Aéronautique Internationale

Each National Federation can only present as contestants and as pilots, their countrymen or those of a country not represented in the Fédération Aéronautique Internationale. An exception however, is made of those countries who were at war with France from 1914 to 1918, unless they should be members of the League of Nations

General Conditions

The race shall constitute an international challenge open to airplanes of Class C The race shall be flown in two contests, each one to consist of a speed contest flown over a distance of about 300 km The race shall be flown in France at the place and on the date fixed by the regulations of that particular year

Prizes

The sum of 200,000 French Francs shall be awarded in the following manner

a Two objects of art, of a value of 25,000 Francs each, which shall be deposited with the Aero Club until they are awarded.

b Two prizes of 75,000 Francs each.

The first contest shall be held in 1924 The winner shall receive a prize of 75,000 Francs. If this race can not be held for any reason, approved by the Aviation Commission of the Aero Club of France, it shall be postponed year by year. If having been held, there shall be no winner, the prize of 75,000 Francs shall be added to that of the second contest.

The second contest shall be held during the year following the one during which the first race is flown. The winner shall receive a prize of 75 000 francs If this race can not be flown for any reason, approved by the Aviation Commission of the Aero Club of France, it shall be postponed year by year If this race having been flown there shall be no winner, the cup and prize shall be awarded to the winner of the first contest In the event where neither of the two contests should furnish a winner the Aero Club of France, with the approval of the donor, shall publish a new set of regulations.

The two objects of art shall be awarded, one to the constructor, the other to the pilot of one of the two airplanes which in the two contests shall attain the highest speed

The contestants, making the entries, are responsible for all accidents, also for damages of every nature caused to third persons

Information Required

The contestants shall send to the Aviation Commission of the Aero Club of France, at a date which shall be fixed by the regulations of each particular year, the following information, under penalty of making themselves liable to being barred from the contest

1. Value of the plane.
2. Name and address of the pilot who logically would fly the plane, also the name and address of his eventual substitute
3. Name and number of plane.
4. Type of the plane and of the motor.
5. Weight and material of the wings.
6. Weight of motor.
7. Weight of propellers
8. Nationality of the entry.

Supplementary Regulations for 1924

The race shall be flown over 300 km, on a circuit of 50 km. in distance, which shall have the starting and finishing lines at the Military Center of Aviation d'Istres, (Department of Bouches-du-Rhone) Landings, repairs and refuellings are permitted

The race shall be flown during June, 1924, and if possible on Sunday, June 22 The entries shall be presented by the National Federations and shall be sent to the Aviation Commission of the Aero Club of France before Feb 1

The race shall take place only in the event that there shall be entries from at least two nations. In case of a cancellation of the race for this reason the entrance fees shall be refunded in full.

The airplanes entered should have performed, at least fifteen days before the race, a trial flight of at least 5 min., either in their own country before three qualified representatives of their National Federation, or in France before three qualified representatives of the French Federation, which is the Aero Club of France The official report of these flights should be received by the Aviation Commission of the Aero Club of France at least eight full days before the date fixed for the race

Under penalty of being barred from the race the airplanes should be sent to the Military Center of Aviation d'Istres at least two full days before the day set for the race

The race can not be won at a speed of less than 200 km /hr

In the event of bad weather the day of the race, the commissioners shall have the authority to postpone it. The postponements can be renewed as often as they deem it necessary

The Freedom of the Air

An Important Court Ruling

The Hon John C Michael, Judge of the District Court of Minnesota, recently rendered a very important decision as affecting air navigation, according to information just received by the Aeronautical Chamber of Commerce In this opinion he squarely rules upon the right of aircraft to fly over private property without being guilty of trespass.

This action, brought before the District Court of Minnesota, followed an accident resulting from an airplane which had flown from a flying field adjoining the plaintiff's premises, falling in his land and damaging his property

The opinion is as follows

"Plaintiff's premises are situate in St Paul, a city of the first class. In June 1923, one of the defendant's airplanes, by reason of some mechanical defect, became unmanageable while in flight, and fell upon plaintiff's lawn.

"This action is brought to recover damages for the resultant injuries, and to enjoin the defendants from operating any aircraft over the plaintiff's premises, regardless of the altitude of such flights. This presents a new question, so far as court decisions are concerned, and there is a singular lack of legislation, both federal and state, in any attempt to define or regulate the right of air navigation The only legislation on the subject in this state is chapter 433, Laws 1921, which goes no further than to forbid all trick flying or aerial aerobatics,

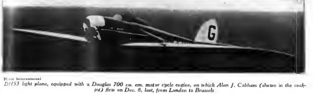

Photo International

DH53 light plane, equipped with a Douglas 700 cu. cm. motor cycle engine, on which Alan J. Cobham (shown in the cockpit) flew on Dec. 8, last, from London to Brussels

or any flight at a less altitude than two thousand feet, over any city of the first class. The act impliedly recognizes the rightful existence of air navigation by this limited regulation, but no attempt is made to define the respective rights and liabilities of such navigators and the owners of the land over which air flights are made.

In the present undefined state of the law upon this subject the plaintiff invokes the old common-law maxim, 'Whose the soil is, his it is from the heavens to the depths of the earth,' and claims that airplane flights over the plaintiff's land, no matter how great the altitude, constitute actionable trespass. If this is a fixed, unalterable rule of property not subject to modification or exception, then the plaintiff's contention must be upheld

This rule, like many aphorisms of the law, is a generality, and does not have its origin in legislation, but was adopted in an age of primitive industrial development, by the courts of England, long prior to the American Revolution, as a comprehensive statement of the landowner's rights, at a time when any practical use of the upper air was not considered or thought possible, and when such aerial trespasses as did occur were relatively near to the surface of the land, and were such as to exercise some direct harmful influence upon the owner's use and enjoyment of the land

"A wholly different situation is now presented We are passing through an age of marvelous achievements in the way of useful mechanical inventions, with the result that practical air navigation is now an accomplished fact Its possibility of great public usefulness in rapid communication and transportation seems to already be well demonstrated.

"The upper air is a natural heritage common to all of the people, and its reasonable use ought not to be hampered by an ancient artificial maxim of law such as is here invoked To apply the rule as contended for would render lawful air navigation impossible, because if the plaintiff may prevent flight over his land, then every other landowner can do the same Condemnation of air lanes is not feasible, because aircraft cannot adhere strictly to a defined course

"Common-law rules are sufficiently flexible to adapt themselves to new conditions arising out of modern progress, and it is within the legitimate province of the courts to so construe and apply them This very rule has been modified by our Supreme Court in respect of subterranean waters. (Erickson v Crookston, etc, 100 Minn 481) When it is sought to enforce such a rule of law, the extent of the public interests involved on one side, as against the probable substantial injury to the private property owner on the other, is an important element of consideration by the courts It is elementary in this country that private property is entitled to a full measure of protection

The air, so far as it has any direct relation to the comfort and enjoyment of the land, is appurtenant to the land, and no less the subject of protection than the land itself; but when, as here, the air is to be considered at an altitude of two thousand feet or more, to contend that it is a part of the realty, as affecting the right of air navigation, is only a legal fiction, devoid of substantial merit Under the most technical application of the rule, air flights at such an altitude can amount to no more than instantaneous, constructive trespass Modern progress and great public interest should not be blocked by unnecessary legal refinements

"The accident in this case has been emphasized as evidence of a great menace from aircraft to persons and property upon the land, and as furnishing a sufficient reason for banishing air flights altogether True, there is some danger from this source, but such accidents are infrequent, and this hazard is infinitely less than is constantly encountered in every walk of life from various other causes An occasional accident has never been considered a sufficient reason for suppressing a useful industry, but may justify reasonable legislative regulation.

"Failure to sustain the plaintiff's contention, relative to upper air trespasses does not deprive him of any substantial rights or militate against his appropriate and adequate remedies for recovery of damages and injunctive relief, in cases of actual trespass or the commission of a nuisance, hence the scope of the temporary injunction has been limited to enforcing compliance with the Minnesota law already mentioned."

Training of Naval Reserves

Editor, AVIATION —

In the Dec. 24, 1923 issue of AVIATION an article appears stating that the Reserve Force of Boston are continuing their training at their own expense This is the case at most Reserve stations where Aviation is a part of the routine, but in case of ours it is just a little worse as we are paying for the use of a plane in which to get our training and must furnish our own uniform such as "monkey suits," goggles, coats and such

We are required to drill on Thursday nights and therefore must meet another night to get in any study on nomenclature and theory and engines. These meetings are held every Tuesday night at one of the members' house and we are instructed by Ensign Fisher who also instructs on Sundays at the Bridgeton Flying Field in the actual flight Ensign Fisher, who was an aviator during the war, is in command of our division.

We now have twenty men in the division. Ten of these men are paying their own way through, while the other ten are merely in the division to learn the ground work

The reason for writing this letter is to let you know that St. Louis, even though it is an inland town, is interested in Naval Aviation, and to get mention in your magazine, because that is the only way we can ever get any attention from the Officers necessary to get us some equipment.

We also have a club called the Naval Reserve Flying Club and that is composed of the men who are trying to qualify as pilots by next year when we go to the Great Lakes for our test.

F F CANNON, U S N R.F.
St. Louis, Mo., Dec 28, 1923

Recent Progress in Italian Airship Construction

By UMBERTO NOBILE

Director of the Italian Government Airship Factory

At the International Congress of Aeronautics in Paris, November, 1921, I summarized the most recent progress realized in Italy in airship construction. Since then the "Stabilimento di Costruzioni Aeronautiche" (Lighter-than-Air Construction Establishment)†, which is the only active establishment in Italy at present dealing with this important branch of aeronautics, and which has fifteen years constructive activity to its credit, has completed a great part of the experiments and studies which had been commenced at that time.

The most important constructions since the Paris Congress are the airships SCA, OS and PM. At present we are building an N airship. The first three airships belong to the stiffened hull type, which is secured by means of a superficial articulated metal framing to whose knuckles is suspended with steel cables a boat carrying the controls, pilots and engines. This type of semirigid airship has now attained the highest grade of perfection and it is particularly suited for small capacities.

The Latest Improvements

The most important refinement tested out in the last constructions mentioned above, consist in the tail end of the hull being stiffened by means of a metal reticule of wide mesh, whose elements are placed along the parallels and meridians of the hull. The elements running along the parallels are joined by the keel stiffening, which, in correspondence with the stern, ceases to be superficial and assumes a prismatic shape, generally with triangular sections.

To four of the elements running along the meridians, and precisely those lying on the horizontal and vertical planes, are connected the fixed surfaces of stability immediately followed by the movable control surfaces. Steel cables connect up one fixed surface to the other and the corresponding knuckles of the keel-stiffening, in such a manner that the entire structure may be considered a non-deformable system. In other words, we have realized a cruciform empennage which is similar in every respect to that adopted in the recent rigid types, obtaining not only a diminution of the resistance to advance but also an increase in robustness as well as greater compactness of the whole system, because the oscillations of the surfaces, referred to the hull, are eliminated. These oscillations were in fact one of the most serious drawbacks of the old biplane or multiplane cellule which was connected directly to the keel-stiffening and bridled to the hull by means of cables, whose tension it was not easy to regulate for all the different conditions of gas pressure. Contemporaneously, we secured another advantage, namely, that the whole system constituted by the fixed and movable surfaces is undeformable even in the case of depression caused by a big loss of gas or by any other trouble.

Aside from the tail-stiffening, other minor modifications were introduced in the airships SCA, OS and PM principally for the purpose of reducing the passive aerodynamic resistances. This refining, however, could not be accomplished thoroughly and efficiently because (and this was the case with the envelopes of airships OS and PM) we utilized parts of former airships for some of the structures.

SCA, OS and PM Airships

In point of general structure, the SCA, OS, and PM airships all belong to the same type, the only difference between them being in the dimensions, a few constructional details and a few devices of secondary importance.

Flexible Hull. The hull of the airship consists of a gas bag whose external envelope is made of three-ply rubberized cotton. The gas bag is divided into a number of compartments by means of transversal diaphragms of varnished silk or rubberized cotton. At the bottom and along the entire length of the hull, the compensating air bag is located, which bag is also divided into compartments by means of transversal diaphragms which are an extension of those of the gas bag. The envelope of the air bag is made of rubberized cotton, or varnished silk.

The gas bag is fitted with special valves, one for each compartment, whose dimensions are proportionate to the maximum climbing speed of the airship. Generally these valves are controlled by the pilot, but may be operated also automatically so that over-pressure is avoided even during the fastest climb.

The pressure on the air bag necessary for insuring indeformability of the hull, is obtained by means of an automatic intake of external air through a valve located in the center of the nose. The closure of this valve is controlled by the pilot.

By means of a system of steel catenary suspensions, the whole lifting force of the hull is concentrated in the bottom of the hull itself in two rows of knuckles arranged symmetrically with respect to the vertical plane of symmetry. The knuckles constitute the summit of the above catenary suspensions.

Keel Girder Construction

Superficial Stiffening of the Keel. The flexibility of the envelope of the gas bag does not permit it to resist compressions caused by the static and dynamic forces, unless, as in the non-rigid dirigibles, a high gas pressure is adopted and all the drawbacks accompanying it. For this reason we have stiffened all parts of the hull in which compression stresses are produced and to sustain which, the tension produced in

Fig. 1. Italian SCA type semirigid airship, built for the Spanish army air service

the fabric by the natural pressure of the gas is insufficient, especially, we have stiffened the keel and the calotte of the prow.

The keel surface of the hull is stiffened by means of a system of steel tube beams which join the tops of the catenary suspensions together where, precisely, the lifting force of the hull itself is concentrated. These connecting elements are placed both longitudinally along two meridians and transversally in normal direction to the plane of symmetry. The indeformability of the system is secured by steel cables placed diagonally between the joints under the keel.

The connection of the joints and beams is secured by means of articulation, thereby permitting the system to make slight movements. This, coupled to the fact that the diagonals consist of steel cables, imparts to the entire system a certain elasticity which is very useful for withstanding violent shocks.

In front, this metallic framing of the keel extends over the entire surface of the nose-piece of the prow by means of a reticulated system made of simple steel tubes arranged along the parallels and the meridians, rigidly joined together, and suitably connected with the envelope. In this way the so-called nose-stiffening is formed, which is indispensable for insuring the shape of the end of the prow without for this purpose having to adopt a high gas pressure.

A similar extension of the metal framing is obtained at the end of the hull; and it is precisely this highly satisfactory

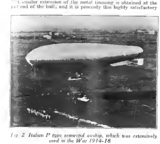

Fig. 2. Italian P type semirigid airship, which was extensively used in the War 1914-18

innovation, which I have introduced in our last constructions, as stated above. Here also, as at the prow, we have a reticulated system of rigid elements, which run along the meridians and the parallels, and which are joined together and to the keel stiffening. The only one substantial difference to the nose-stiffening is that for a considerable length up to the end of the tail, the framing ceases to be superficial and becomes prismatic with triangular section. In this manner the shape of the tail is practically maintained, even when there is no pressure in the air bag, or when depression is caused by a great leak of gas through a rent torn accidentally in the external envelope.

To the stiffened tail, are attached the surfaces of stability, and their extension forms the rudders and elevators.

In other words, the surfaces lie in two planes, one vertical and the other horizontal, passing through the longitudinal axis of the dirigible, so that they form a cruciform empennage.

Power Plant Arrangement

Pilot and Engine Car. In these three small airships the control-cabin and the engines (two in number) are located together in one single car, whose exterior shape is that of a boat of good penetration, and so made that it may float and advance easily on the water. The front part of this boat is reserved for the pilots and in it the various devices are arranged so that one person may control the airship both in the horizontal and vertical directions. The controls of the elevators and the rudders are non reversible, so that the pilot not only does not support their effort but may even abandon them completely for a few minutes.

Two engines are located at the stern of the car and are supported side by side by a special steel framework. Each engine is fitted with a wooden propeller in direct drive. The gasoline and oil tanks are located near the engines. All the necessary precautions are taken against the danger of fire, which in fact, never has occurred so far in any of the 68 airships built by us.

The boat is connected to the keel joints by means of a simple steel cable suspension. This system of attachment facilitates landing in that the hull cannot be damaged in the event of shocks on the ground.

The front part of the boat is enclosed and fitted with large windows. The car of the OS is furnished with six armchairs and a lavatory also for the convenience of passengers during a long flight. These conveniences are really considerable seeing that the airship is so small.

The most important characteristics and dimensions of the three airships mentioned above are as follows:

DIMENSIONS AND AERODYNAMIC CHARACTERISTICS

Data	*Airship SCA*	*Airship OS*	*Airship PM*
Volume cu. m.	1520	4970	5270
Length, m.	38.50	67.70	67.10
Maximum height, m.	14.00	20.70	20.20
Maximum width m.	8.00	13.60	13.60
Type and no. of motors	2 Anzani	2 Colombo	2 Spa
Total power hp.	80	240	380
Max. speed in km./hr	82.8	85	84.4
Useful load (including equipment and crew and supposing a lifting force of 1150 grams per cu. m. in kilograms)	850	2500	2180

Results Obtained. During the tests and subsequent flights, the above named three airships all gave excellent results, fully confirming that this general type of Italian concept has now reached a high degree of perfection, so that we may state that for the small capacities there is no other type of airship to compete with it as regards nautical and aerodynamic qualities. Other characteristics peculiar to our type are: The sturdiness of the various structures, the easy assembling and dissembling and the low cost of production.

The construction of the airship SCA, of which two examples have been bought by the Spanish navy, has to be considered therefore as a really great success of aeronautical technique. A few years ago it would have seemed absurd to make a semirigid airship of so small dimensions. Today it is not only built, but it gives the brilliant results of useful load and speed shown in the above table.

The two airships PM and OS are to be considered as transformations of the P and PV types, whose first examples were built respectively in 1912 and 1918. A comparison of the types will reveal the amount of progress which has been made.

The characteristic data of the airships P and PV are as follows:

CHARACTERISTICS OF P AND PV TYPE AIRSHIPS

	Airship P	*Airship PV*
Volume cu. m.	4900	5200
Total horse power	140	360
Speed km./hr	85	83.3
Useful load kg. (supposing a lifting force of 1150 grams per cu. m.)	1835	1880

Index of Efficiency

In order to compare the four airships the following must also be borne in mind:

(a) The coefficient of utilization, which we shall give as δ, understood as ratio between the useful load and the total lifting force;

(b) The maximum velocity v;

(c) The aggregate aerodynamic efficiency which can be measured, as I have already suggested, by the ratio between the product $V^{2/3}v^3$ and the motive power N, that is, as a ratio between the efficiency of the propellers η and the coefficient of resistance K of the formula $R = kV^{2/3}v^2$.

It is a very difficult thing to establish one single expression which rationally takes into account all the above three elements. To simplify matters, and seeing we are dealing with airships of more or less the same capacity, we are of the opinion that as *index of efficiency* of the airship we may assume the product of the three elements. The following table shows briefly the results:

INDEX OF EFFICIENCY FOR ITALIAN SEMIRIGID AIRSHIPS

Airship	δ	v	$\frac{\eta}{K}$	$\delta v \frac{\eta}{K}$ (*Index of Efficiency*)
P	0.328	85.0	587,000	$10^6 \times$ 12.0
PV	0.331	83.3	574,000	17.1
PM	0.538	94.4	370,000	22.4
OS	0.485	85.0	748,000	27.8

*Paper read at the International Air Congress London June 29, 1923

†This Establishment belongs to the Italian government.

We clearly see the enormous progress that has been made. The efficiency of the PM is about 1.88 times greater than that of the P, whereas the efficiency of OS is 2.3 times that of the P, and 1.6 that of PV.

In view of its small capacity, the SCA cannot be compared to advantage except it be with airship E. The data and results follow:

CHARACTERISTICS OF E AND SCA TYPE AIRSHIPS

Type	Volume	δ	V	$\frac{\eta}{K}$	$\delta V \frac{\eta}{K}$ (Index of Efficiency)
E	2600	0.48	68	385,000	$10^6 \times 10.2$
SCA	1500	0.30	82	870,000	" 20.7

Consequently we find an aggregate improvement in the case of the SCA of 28 per cent with respect to the airship E, notwithstanding the extremely small capacity, which is very close to the minimum practical limit for the construction of an airship.

Type N Airship

The type of airship which we have described briefly, is characterized by a superficial metal framing which, in front, extends and develops into a nose-stiffening for sustaining the outside pressure, and in the rear, into a tail-stiffening for sustaining the stability and maneuvering surfaces. Especially suited for small capacities, we consider it an excellent type for capacities up to 6000 cu. m., but it may also be adopted with good results for larger capacities up to at least 15,000 cu. m. For volumes over 15,000 cu. m. there is no advantage in maintaining the superficial stiffening of the keel peculiar to this type, and instead, it is expedient to adopt a prismatic stiffening which may be realized by means of a metal framing having a transversal section of triangular, or, more generally, polygonal shape.

Two longitudinal beams of the framing (when of triangular section) run along two symmetrical meridians of the hull, and the relative knuckle joint also in this case correspond and are attached to the top of the steel catenary suspensions where the lifting force of the gas is concentrated. The T34 (Roma) belonged to this type (35,000 cu. m.), the excellent results reached in the tests fully confirming the possibility and the advantage of using semi-rigid structures also for large capacities.

The N type is undoubtedly a great improvement on the T34 except, of course, as regards the volume, which was fixed at only 19,000 cu. m. in view of easily housing it in all the existing hangars in Italy (Rome, Milan, Taranto) without however renouncing the advantage of a well-shaped hull which is impossible of realization with a larger capacity than that adopted.

The following are the chief modifications introduced in the N type of airship which must be considered distinct improvements in comparison with the T34 type:

1. A hull shape of better penetration;
2. A tail-stiffening for sustaining the fixed and movable planes;
3. A control-cabin located forward, near the bow, with excellent visibility for the pilots, and in direct communication with the interior of the keel-stiffening, the space in this type being utilized for locating the gasoline and water tanks;
4. Engine nacelles detached from the hull and suspended to the keel-stiffening by means of simple steel cables;
5. Reduction to a minimum of all the passive resistances, and consequently suppression of the lateral air intakes for feeding the compensation chamber of the hull.

Shape of the Hull

1. *Longitudinal shape.* Undoubtedly the selection of a suitable shape is of paramount importance for securing good aerodynamic efficiency. However, the selection is influenced also by considerations of various kinds, as for instance, the distribution of the lifting forces and of the loads. In our particular case we were obliged to base our selection on a compromise between the convenience of having a shape of the best possible penetration, and that of having an airship of the largest capacity commensurate with existing hangar accommodation. The longitudinal shape adopted in our case may be seen in Fig. 3, which shows the longitudinal shape of a model of the airship M (built in 1915), a model of the airship T34 (built in 1919) and a model of the airship N.

On the resistance to advance of the three models being measured in the wind tunnel ($R = kV^{2/3}v^2$, where V is expressed in cu. m., v in km./hr. and R in kg.), we found the following values for k:

Shape	I	II	III
k	0.0038	0.0041	0.0033

These values are considered in a relative sense, because they are all larger than those ascertained from experiments on the real airships. At any rate they demonstrate that while the shape selected for the new type of airship could be even better yet, it is superior to those adopted for the M and T34 types.*

2. *Transverse Shape.* Fig. 4 shows the shape of the major transverse section of the airship N at normal flying pressure. Compared to the section of the T34, the width of the metal framing is such that its inclined members lie on the tangents of the hull shape, consequently the reentrant angle obtaining in the T34 is entirely eliminated.

The system of inside steel cable catenary suspensions for collecting the lifting force of the upper part of the hull and conveying it directly to the knuckle joints of the metal framing, substantially is not different to that adopted in the former Italian airships of a capacity up to 600 cu. m. The purpose of such a system is dual, viz. that of reducing the stresses on the fabric forming the outside envelope, and that of reducing the maximum vertical diameter of the hull.

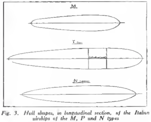

Fig. 3. Hull shapes, in longitudinal section, of the Italian airships of the M, P and N types

In the case of the airship type N the inside catenary suspensions are two in number; in correspondence of each one of which the hull surface is furrowed.

The question was whether or not these longitudinal furrows had the effect of increasing head resistance. To solve which I tested a model (1:200) of the T34 in the wind tunnel first with furrows (three in number) and then without furrows. The results were so very peculiar that I think they are worth reporting. The resistances are expressed in grams and the test wind velocities in meters per second. The tests were made with different vertical inclinations of the model on the wind direction.

INFLUENCE OF FURROWED HULL ON HEAD RESISTANCE

	Wind Velocity in Meters per Second					
	18 m./sec		28 m./sec		30 m./sec	
	with furrows	without fur	with fur	without fur	with fur	without fur
−15°	23	25	80	88	210	198
−10°	17	18	65	60	148	145
−5°	14	14	52	52	115	114
0°	13	13	47	48	105	106
+5°	14	15	51	52	113	110
+10°	18	20	68	70	154	153
+15°	25	30	99	102	237	225

*Wind tunnel tests of a proposed T120 type, of 120,000 cu. m. capacity gave $K = 0.0028$

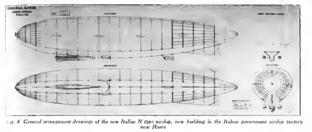
Fig. 4. General arrangement drawings of the new Italian N type airship, now building in the Italian government airship factory near Rome

From the above figures it may be deduced that in many cases the effect of the furrows is to diminish head resistance, and we may conclude that their influence is negligible, particularly when the axis of the airship is in the direction of the wind.

Subsequently I planned another series of tests in view of ascertaining the importance of the irregular pear shape of our airship in comparison with a circular shape. To this end I had the head resistance of two models (1:200) measured, one of which reproduced the hull of the T34, and the other, while having the same volume and the same longitudinal shape, constituted a body of revolutions.

The results were as follows:

Air Speed v	Pear shape	Round shape
	(Resistance in grams)	
1 m./sec.	24	23.5
2 m./sec.	43	42.6
m./sec.	67	65.5
m./sec.	97	94.5
m./sec.	132	130.0

From these figures we may deduce that the pear shape has greater head resistance than the round shape, but the difference is only 2 or 3 per cent, which is practically negligible.

The Rigid Framing. As stated above, the keel of the hull in the N type is stiffened by means of a prismatic framing with triangular section connected to the tops of the external catenary suspensions; in correspondence with the control cabin whose framework forms part of the keel-framing, this has a trapezoid section.

The three longitudinal members of the framing, as also the three members of the triangular section, are made of steel and are similar in constitution to that of the type of airship with a superficial stiffening. Each beam consists of three steel tubes arranged in the shape of a triangle joined by diagonal steel braces. Also in this case the beams are articulated at the knuckles. The articulation at the joints and the use of nonrigid diagonals of steel cables, impart great elasticity to the framing, so that it is able to absorb accidental shocks due to rough landing or shocks occurring in the event of the airship being moored close to the ground or on the water for a considerable time.

The strength of the framing is such that it is able quite well to resist any abnormal stresses that might be created in the event of the gas compartment getting accidentally emptied, which is quite possible during service in war time.

Control Cabin, Engine Cars. The control cabin is located forward. As stated above it forms part of the keel-stiffening, and is in direct communication with the interior of the keel. The fore part of the cabin is reserved for the pilots, and includes all the equipment and instruments necessary for navigation, as well as a radiotelegraphic and radiotelephonic set. The passengers are accommodated in the back part of the cabin. There is accommodation for twenty passengers, with every modern comfort for a long trip.

The three engine cars, whose framework is of duralumin, have a good streamline. They communicate easily with the interior of the keel although suspended by steel cables, which system is of undoubted advantage in the event of accidental shocks on the ground. Each engine car is equipped with one 250 hp. engine, which by means of a friction clutch drives a propeller. One of the nacelles may have a reverse gear engine.

Nose-stiffening and Tail-stiffening. The keel-stiffening at both ends of the airship extends in such a way that both the nose and the tail may be considered rigid and rigidly joined to the keel-framing.

In this type of airship the tail-stiffening, whose purpose is to sustain the stabilizing and control planes, is not substantially different from that of the SCA, OS and PM types described above. However, as regards the nose-stiffening there is one important difference. The stiffening, in the case of the above three airships, must be considered as a semirigid system, because it is unable to maintain its form in the event of the internal pressure lacking, whereas in the N type it is really a rigid system and rigidly connected to the metal framing so that the nose is practically non-deformable even if the internal pressure should fail entirely. This characteristic is clearly of the highest importance because it relieves the pilot of the trouble of regulating with great attention the pressure of the gas during navigation.

Conclusions

The general dimensions and characteristics of the new type of airship follow:

CHARACTERISTICS OF THE N TYPE AIRSHIP

Capacity, 18000 cu. m.
Length 106 m.
Maximum height, 20 m.
Maximum width, 19.50 m.
Total horse power, 750 hp.
Maximum speed 100 km./hr.
Useful load, 10850 kg.
(assuming a lifting force of 1150 grams per cubic meter)

If the speed and useful load given above are confirmed by actual test flights, as we hope, we shall get for the new type of airship the following results:

Utilization coefficient . . . . $\delta = 0.495$

Ratio of propeller efficiency to

coefficient of resistance . . . . $\frac{\eta}{k} = 950\,000$

Efficiency of the airship $\delta v \frac{\eta}{k} = 10^6 \times 47.1$

For the T34 we had

$$\delta = \frac{19000}{40400} = 0.47$$

$$\frac{\tau_i}{L} = \frac{1071 \times 109.8}{2100} = 678000$$

Efficiency of the airship

$$6e = \frac{\tau_i}{L} = 10^? \times 35.0$$

Consequently we shall have realized an improvement of 34 per cent, and perhaps a little more, because on the T34 type the power corresponding to the speed of 109.8 km/hr. was probably of 2400 hp instead of 2100 hp as at first it seemed to us to be

At all events the N type will represent a further important progress in the Italian method of building airships, and be the first example of a series of important constructions which will inevitably tend toward great volumes without, however, neglecting the small, handy, cheap airships to which will always remain open an extensive field

As far as the small volumes are concerned, the Italian semi rigid has no competitors, but also the large semirigid is no longer a problem to solve, because the plans for a 120,000 cu m airship are ready and only require realization

St. Louis as a Lighter-than-Air Craft Center

By ARTHUR C HOSKINS

Director, St Louis Flying Club and former pilot, U S Navy Flying Corps.

The supremacy which St Louis gained as a center of free ballooning through the start there of half a dozen international and national contests and the development of a larger number of free balloon pilots and enthusiasts than are to be found elsewhere in the United States, bears a direct relation to a vital development in air navigation

To many observers the commercial possibilities of long distance air navigation lie with large airships, which have proved a profitability not generally realized in America The famous flight of the English R34 which, in July 1919, crossed the Atlantic in 108 hr and returned in 75 hr is, of course, remembered It is not so generally known that in the three years before the war the German Airship Transportation Co ("Delag") carried 34,288 passengers without an accident, and that after the war the Bodensee, a comparatively small Zeppelin, carried 2,380 passengers in 103 flights

These achievements forecast the day when Scott Field, Belleville, Ill, one of the great lighter-than-air stations of the country, supplemented by a splendid landing station in St Louis Field, in convenient proximity to the city, will establish St. Louis as a chief airship port Scott Field already affords adequate housing facilities for airships in the shape of a million dollar hangar This will shortly be supplemented by a large mooring mast, now under construction

St. Louis' Ballooning Record

The central location of St Louis, so advantageous for airship transportation, has been also a factor in the city's really distinguished record in ballooning Considering it as a sport, it has been popular out that it is the one sport in which St. Louis has been outstandingly successful After Maj Albert Bond Lambert had been instrumental in bringing the First International Gordon Bennett Balloon Race there in 1907—a contest witnessed by 300,000 people—the most notable balloon contests held at St. Louis were the international race of 1907, the Centennial of 1909, the international of 1910, the national races of 1914 and 1919 and the Army and Navy race of 1919 Alan R Hawley and Augustus Post in the Fifth Gordon Bennett Race (1910) established the existing American distance record of 1172 miles, landing at Lake Chatogama, Quebec They were rescued from the wilds, after having been given up for lost In the Centennial of 1909 Clifford B Harmon made record flight of 48 hr 26 min which is still the American duration record

An evidence of the long period over which flights have been made from St. Louis is the record of John Wise, America's pioneer aeronaut, established in 1859 in a 500 mile flight to Henderson, N Y This performance stood as a world's record until the St Louis international race of 1907 John Wise who was the inventor of the rip panel, was drowned in a flight starting from Grand and Lindell in 1879 The body of his companion was washed up on the shore of Lake Michigan

H E Honeywell has covered some 3854 miles in official contest starting from St. Louis. He is a St Louisian who has participated in twenty four balloon contests in the United States and Europe

Three classes of balloon pilots have developed: first, sportsmen such as Albert Bond Lambert, the late James V Benus, Colonel Shields, Harold M Bixby, Albert Von Hoffman and others, second, professionals of pre-war days who became all the more proficient in the qualification of hundreds of student officers, some of whom are H E Honeywell, Paul J McCullough, J S McKibben, E S Cole; and third, officers trained under government direction during the war The latter numbered more than 400, some seventy five balloons having been manufactured at St. Louis for that purpose Scores of these men are now enthusiastic adherents of ballooning as a sport.

What Makes a Good Balloonist

The successful racer and long distance balloonist is the well grounded student of meteorology, who knows where to find the winning winds Ballooning is the simplest navigation of the air The balloonist roughly governs his direction by throwing ballast to ascend or descending by opening the valve at the top of his bag At different levels the winds blow at different direction and at different speeds. The action of the sun and the cold air currents in expanding or contracting the gas causes the bag to rise or fall and this must be properly compensated by valving gas or throwing ballast

It is the skill and judgment acquired by the free balloonist in these operations to maintain his sphere at an "equilibrium" as it is called or on a fairly even latitude which is invaluable in the management of the airships.

Owing to their enormous size and buoyancy, airships are especially susceptible to being driven about by high winds and air currents. Their pilot must ever be prepared to "free balloon" them For ballast many tons of water are carried in bags. If the gas, due to seepage or a leak, is insufficient to keep the ship afloat, as was the case with the L49 which squatted in France during the war, these waterbags are emptied and sometimes even the empty gasoline tanks are dropped overboard The normal method of descent is to use the elevators and rudder, set like those of an airplane, so that the ship will be driven down by the power of its engine

There is a vast gap from the free balloon of about 80,000 cu ft of gas floating with the wind to the great leviathans of the skies buoyed up by 2,000,000 and more cu. ft and driven by motors at 80 mi /hr Yet the use of airships gives new significance to what was once regarded as little more than sport—though a glorious sport—of drifting through the clouds in free balloons St. Louis' veteran band of seasoned aeronauts and her reserves of enthusiastic younger balloon pilots may find a new premium on their services now that airships are coming into their own.

A Seaplane Base for Commercial Air Transport

By EARL D OSBORN

The following is a description of a commercial seaplane base located in Florida from which F5L twin Liberty flying boats, converted to carry ten passengers, were operated for a period of over three years. The full development of the base, on which over $50,000 was spent in maintenance, was limited by the configuration of the harbor and by lack of funds In its ultimate development it contained the essentials of a base for the operation and maintenance of seaplanes, and though not perfect, it was practical

The movable equipment consisted of three moorings in protected water, a raft to which planes taxied to take on or discharge passengers and a motor boat which took the passengers

Twin-engined passenger flying boats riding on their moorings in sheltered waters

to the dock and custom shed There was also a boat fitted with a gas storage tank and pump, which was towed out to the planes for refueling The land equipment consisted of ½ acre of ground on which were located an office and rest room for passengers, a carrier pigeon coop a radio mast, a repair shop, a hangar capable of holding the hulls only of two F5L's (costing about $1200), a dope house and a runway (costing $1000) It was only by the end of the third year that all this equipment was available

Problem of Landing Passengers

While experience showed that commercial seaplanes can be operated with a motor boat and dock as the sole base equipment, it became nevertheless evident that for large scale operations a more elaborate base equipment would pay its cost not only by the saving of time and labor but also by creating a favorable impression on the passengers.

The method of bringing a seaplane up to a raft and taking passengers ashore in a motor boat is admittedly clumsy beside being annoying to the passengers and wasteful of time for the crew in making repairs, getting parts etc. Where space and the prevailing winds allow it, a T shaped dock offers a fair solution of the problem, but there is serious danger of injury to hull or wings if the pilot miscalculates his distance or if the motor quits and the wind drifts the plane A raft gives it it is rammed, the wings can pass over it and there is space to anchor if the motor quits. Also it can be approached from any direction It is, however, dangerous to tie a plane to a raft for if the water gets rough the plane and raft pitch in opposite directions, putting a terrific strain on the short coupling Furthermore, a sudden puff may swing the raft and plane together

Moorings Must be Heavy

Moorings must be extremely heavy, with plenty of slack to allow for pitching Small planes can be run up on a runway under their own power, which is an ideal way of operating, but large planes must be put on a cradle and hauled out either by a tractor, or by a tackle attached to a winch or motor truck If the water gets rough, or the wind is in shore, this is difficult and in any case requires several men, much time and great care, or else the bottom will be strained The Navy haul their seaplanes out daily, but then they have long concrete runways, tractors, lots of men and at that they often strain their bottoms As a matter of fact neither system is satisfactory, and there is considerable field for improvement

On shore an office, a waiting room and comfort station for passengers are essential, but need little description The carrier pigeons did not give very good results, but it should be noted that the company lacked time in which to break them in and an expert to care for them Of the birds released from planes only a small percentage returned, probably due to lack of training, though some were killed by hawks The radio telephone worked with satisfactory reliability up to 100 mi. distance and offered great relief to the management by enabling it to know how the ship was faring on over sea trips. However, the set weighed nearly 170 lb and required an operator on board the plane and one at the shore station Its high original cost together with that of maintenance and operation, plus the incidental diminution of useful load, made it too expensive for practical use. It is unfortunate, though, that owing to various circumstances there was no chance to test the radio telephone in a forced landing, which is what the apparatus was wanted for.

In Florida, with its equitable dry climate, a hangar is not as necessary as in the North. The cost of a hangar capable of holding several F5L's with their 105 ft wing spread would be very great and probably not worth while By building a hangar for the hull only and storing the wings during the summer or when major repairs were required the company struck a satisfactory compromise A T shaped hangar for sheltering a reserve ship all set up would probably have been worth while and it could have been built at a moderate cost, as the roof would only have to be braced across the chord of the wing instead of over the span

Shop Equipment

The shop was an L shaped building roughly 60 by 60 by 30 ft It contained a small stores room, space for storing wing panels, a carpenter shop and a motor repair shop The carpenter shop had space enough to lay out a wing panel and had the usual carpenter's bench with vises, etc., and it also had an electrically driven band saw An electric planer would have been useful, but not essential Due to the mild climate it was possible to do the hull work outside or in the hangar There was a separate dope and paint house with a special rig so that one man could turn over a wing panel The motor repair shop had an electric drill and a welding outfit beside special tools, such as reamers for camshaft housings, mandrels for bearings, etc.

FRANCE SWEEPS UP AIRPLANE ORDERS

French aviation factories are crowded with orders for the present year. More are expected if the present high rates of exchange are kept up, and this will require the bringing in of skilled labor from England and Italy.

The export figures for last year are not yet completed, but officials of the Production Syndicate are convinced that the total will be more than double the record number of planes constructed in 1921, which means more than 2,000 complete machines in addition to motors and spare parts.

Much of this year's quota, however, will be for the Little Entente nations, with the French Government footing the bill, in accordance to the advances already voted by Parliament. Besides these orders and large demands by Russia, French makers are now furnishing Japan, Italy, Spain and the South American countries, chiefly Brazil, all of which during last year bought both commercial and military planes.

Few orders are expected from the United States, construction there developing parallel with that in France, although, with the depreciation of the franc, motor-makers hope to find an entering wedge.

From N. Y. Herald (Paris Edition), Jan. 4, 1924

Considerable time was spent with good effect in organizing the procedure of motor overhaul. Stands were built to bring the motor to a convenient height and these were placed between two work benches equipped with vises etc. Above the benches were racks for the twelve cylinders, a special box for pistons, etc. There was a special stand for the crank case and another for scraping in the camshaft bearings. A special rack fitted with a piston on a lever, which held a cylinder partly filled with gasoline under pressure from the piston, showed whether gasoline would leak through the valves after they had been ground. There was also a box on rollers with compartments for bolts, nuts, etc.

A well planned and equipped base makes it possible to use the planes intensively with a minimum waste of time and labor. It is one of the key factors in the success of the enterprise. Such a base is also of considerable value to the Navy in case of emergency landing and could be used as a nucleus for expansion in case of war. It would seem to be mutually advantageous if the Navy and commercial air transport companies could cooperate in the establishment and maintenance of permanent bases.

Aviation in Congress

Senate, Dec. 6, 1923

Mr. Wadsworth: a bill (S 76) to create a Bureau of Aeronautics in the Department of Commerce, to encourage and regulate the operation of civil aircraft in interstate and foreign commerce, and for other purposes.

Referred to Committee on Commerce.

House, Dec. 13, 1923

Mr. Winslow: a bill (H R 3243) to create a Bureau of Civil Aeronautics in the Department of Commerce, encourage and regulate the navigation of civil aircraft, and for other purposes.

Referred to Committee on Interstate and Foreign Commerce.

Senate, Dec. 19, 1923

Mr. Wadsworth: a bill (S. 1538) to create a Bureau of Civil Aeronautics in the Department of Commerce, encourage and regulate the navigation of civil aircraft, and for other purposes.

Referred to Committee on Commerce

Senate, Jan. 7, 1924

S 76 (introduced by Mr. Wadsworth) reported with amendments by Mr. Jones of Washington, Chairman, Committee on Commerce.

Senate, Jan. 8, 1924

S 76 (introduced by Mr Wadsworth) passed unanimously, with slight amendments.

S 76 has been known for several years as the "Wadsworth Bill." As S 3076 it passed the Senate in February, 1922. On reaching the House it was referred to the Committee on Interstate and Foreign Commerce. Mr Winslow, the chairman of the latter Committee, realizing the importance of the subject and appreciating further, that some members of the House were not fully informed, proceeded with care and deliberation, and after prolonged conferences with the Department of Commerce and other departments, evolved practically a new bill, which, as H.R. 13715, he introduced on Jan. 8, 1923. This bill, due to congestion, never got out of the Committee before the 67th Congress adjourned.

Immediately after the convening of the new Congress, Senator Wadsworth re-introduced the former S. 3076, known now as S. 76.

On Dec. 13, Mr. Winslow re-introduced his bill, known as H. R. 3243 and Senator Wadsworth agreed to sponsor it in the Senate which he did, presenting it on Dec. 19 as S. 1538.

In the meantime the old Wadsworth bill had gone through Committee and pursuing a course made easier by work in the last four years on behalf of civil aeronautics, passed the Senate after brief discussion.

It is expected that the Winslow Bill will be passed shortly in the House. If and when this comes about the Winslow Bill (H.R. 3243) and the old Wadsworth (S. 76) will meet in conference.

Differences between these measures are to be found only in the thoroughness of preparation and carefulness in detailed consideration of the relation of proposed air regulation to existing law as set forth in H.R. 3243. There is no conflict. The Winslow bill (H.R. 3243) being a later version, prepared by Frederic P. Lee, former Assistant Chief of the legislative drafting service of the House and now Chief of the Senate service, is the more complete. The fact that Mr. Wadsworth introduced it in the Senate leads to the conviction that in conference a common bill, embracing the improvements of H.R. 3243 will be approved.

—*Aeronautical Chamber of Commerce*

An Analysis of Propeller Tests

N.A.C.A. Report No. 175

Report No. 175 of the National Advisory Committee for Aeronautics, by Max M. Munk, is a critical study of the results of propeller model tests made by W. F. Durand and E. P. Lesley with the view of obtaining a clear insight into the mechanism of the propeller action and of examining the soundness of the physical explanation generally given. The nominal slipstream velocity is plotted against the propeller tip velocity, both measured by the velocity of flight as a unit. Within the range corresponding to conditions of flight, the curve thus obtained is a straight line. Its inclination depends chiefly on the effective blade width, its position on the effective pitch. These two quantities can therefore be determined from the result of each propeller test. Both can easily be estimated therefrom for new propellers of similar type. Thus, a simple method for the computation of propellers suggests itself.

The slip curve mentioned is not a straight line along its entire length. At a small relative velocity it is bent up, because the lift curve of the blade sections used is bent up that way at small lift coefficients. At a certain high relative tip velocity the slip curve shows a break and runs then straight again but at a different slope. The slope is increased so that at zero advance the propeller develops a larger thrust than could be expected from the magnitude of the thrust in flight.

A copy of Report No. 175 may be obtained upon request from the National Advisory Committee for Aeronautics, Washington, D. C.

Recent Developments in Aircraft Instruments

Annual Report of Bureau of Standards Indicates Important Progress

The annual report of the Director of the Bureau of Standards, just made public, contains among other things interesting information on the research and development work done by the Aeronautic Instruments Section of the Bureau for the Army, the Navy and the National Advisory Committee for Aeronautics.

This work is considered under two heads: First, experimental investigations and researches relating to the fundamental physical principles in instrument development; and second, practical design and construction of new aircraft instruments. The more important references of this report are quoted below.

Bourdon Tubes and Diaphragms

Investigation of Bourdon tubes has included the development of the theory of their deflection and a study of their elastic errors.

The investigation of metallic diaphragms has been continued, both as regards the determination of empirical laws for the deflection of such diaphragms and as regards their elastic errors.

Thin rubber and a large number of leathers and doped fabrics have been studied during the past year to determine their possibilities for use as nonmetallic diaphragms. Tests have been conducted to determine the permeability of the various materials to air for a large range of pressures. The effect of humidity and the fact that some of the most promising materials were quite permeable to air led to the attempt to reduce these effects by the surface application of various dopes furnished for the purpose by the chemistry division. It was found that these dopes closed the pores of the material, rendering it less permeable and reducing the effect of humidity, but that the effect of temperature changes on the material was greatly increased. It is considered that alum-tanned colon leather is the most suitable of all the materials yet studied for use as a non-metallic diaphragm.

Two sylphon diaphragms exhausted to a low pressure and provided with internal springs were tested for the Army Air Service to determine the magnitude of their elastic errors.

Gasoline Flow Meters

A report containing the results of a thorough investigation of the performance of various types of flow meters suitable for aircraft has been submitted to the Bureau of Aeronautics, Navy Department. The balanced-vane type was found to be superior to the vertical float type of instrument. A report on an experimental model of a flow meter based on the principle of determining the rate of flow by measuring the temperature to which a constant and known supply of heat energy raises the inflowing liquid has been submitted to the engineering division, Army Air Service.

Investigation of Aircraft Sextants

An investigation involving the study and testing of all the types of aircraft sextants for the purpose of finding the most suitable form for aircraft use, has been completed for the present. During the past year two types of sextant were studied. A tentative design for an improved bubble sextant, based on the results of this investigation, has been prepared.

Considerable work has been done in developing the theory of the leak type of rate-of-climb indicator. The work has been divided into two parts: (1) The general theory of the instruments and (2) the effect of temperature on the indications. This research was conducted in connection with the development of rate-of-climb instruments.

The use of maps in finding position from astronomical observations has been studied. This investigation, which covers the problem of methods for the reduction of astronomical observations suitable for aircraft use, has been completed.

Aerial Navigation

A report on the navigation of aircraft by astronomical observations is nearing completion. This report includes a brief outline of the theory of astronomical position finding and its application to the navigation of aircraft, as well as a complete bibliography of the subject. Instruments for observation are described, and the problems encountered in their use are discussed. A report on night and cloud flying has also been nearly completed. This report includes a discussion of aerial lighthouses and beacons, field lighting equipment, and devices for aid in landing in fog.

A report has been prepared embodying the results obtained from extensive laboratory tests on forty-three makes of airplane compasses representative of American, British, French, German, and Italian service and experimental instruments. The experimental work was conducted in cooperation with the Bureau of Aeronautics, Navy Department.

The gear-driven ground speed and drift indicator of the optical synchronized type has been completed and delivered to the engineering division, Army Air Service. This instrument contains a specially designed five-speed gear box to provide for the range of speeds required in the instrument. The instrument was found to function satisfactorily both in laboratory and in flight tests.

A distant indicating tachometer of the commutator-condenser-galvanometer type has been designed and constructed. The commutator is attached to the shaft whose speed is to be measured and alternately charges a condenser from a battery and discharges the condenser through a sensitive galvanometer, the successive discharges coming with sufficient rapidity to produce a steady indication on the galvanometer. This instrument has the advantage that it can be used under circumstances where but a small amount of power is available to operate the speed measuring device.

Turn Indicators

The new electrically driven gyroscopic turn indicator has been completed. Laboratory and flight tests on the instrument compare favorably with those on the air-driven instruments. This instrument, however, has the advantage, especially when used on lighter-than-air craft, in that its sensitivity is the same at all speeds, while an air-driven instrument does not function satisfactorily at low air speeds. Several new instruments of this type designed during the past year by private firms have been studied in the laboratory and in flight.

A new electrically driven gyroscopic turn meter has been designed and constructed. It consists of a small, specially constructed battery motor in which the armature rotates about the field on ball bearings, thus forming the rotor of a gyroscope. The gyroscope is mounted in such a way as to allow it to precess about one axis only, the fore and aft axis, when mounted in the aircraft. The turning movement of the ship causes precession about this axis, which is indicated by a suitable mechanism. This instrument is extremely sensitive and measures quantitatively the rate at which the aircraft is turning from a given course.

The horizontal angle indicator, which is intended to be used in range-finding work from captive balloons or dirigibles, measures simultaneously the horizontal projection of the angle between two given points and the depression angles to each of the points. This instrument has been constructed during the past year and is now practically ready for test.

Altimeters

A combined altimeter and barograph provided with an indicating dial like an ordinary altimeter and with a recording device similar to that of the older model precision barograph described in last year's report has been designed and constructed. The present instrument is an improvement of the older model, having been considerably reduced in size and

otherwise modified However, the straight-line motion of the pen, which was the main feature of the former instrument, has been retained, thereby making possible the use of rectangular coordinates on the chart. This instrument has been given its preliminary laboratory test and should soon be ready for flight tests.

The use of a bimetallic strip for temperature compensation in altimeters has been found unsatisfactory because of its thermometric lag. Considerable development work has been conducted on an altimeter which is to be corrected for free air temperature by the use of an element operated by the change in volume of a liquid which completely fills an expansion chamber.

A temperature-compensated thermobarograph has been under development during the past year. This instrument gives a record of altitude corrected for air temperature, together with a record of the air temperature itself.

Three open-scale altimeters suitable for the landing of aircraft are under construction for use on the Navy rigid dirigible ZR1. They have a range of about 3,000 ft. and are provided with a protective apparatus which prevents the injury of the instruments if the craft is flown at higher altitudes. It is expected that these instruments will not have an error greater than 10 to 20 ft. A very important problem in connection with these altimeters is the location of a suitable point for mounting the outlet or static head when they are used on heavier-than-air craft. The static pressure at the point where the instrument is mounted differs slightly from the static pressure of the free air at the same level owing to the flow of air around the fuselage. This effect is too small to affect the reading of the ordinary altimeter, but might cause errors several times as great as the maximum allowable error for these sensitive instruments.

The automatic electrically-operated valve used in a mechanical statoscope required further development before the instrument gave satisfactory performance. This work was carried out during the past year, and the instrument was completed and delivered to the Army Air Service.

Rate-of-Climb Indicators

An improved mechanical rate-of-climb indicator of small size, for use on heavier-than-air craft, is nearly complete, and should soon be ready for flight tests.

A liquid rate-of-climb indicator with a very open scale has been designed and is now being constructed. This instrument is of importance in weighing off and landing dirigibles, the navigating officers depending on it almost entirely for this purpose. It is expected that this instrument will be tested and put into service on the Navy rigid dirigible ZR1 shortly.

Two types of combined statoscopes and rate-of-climb indicators have been under construction during the past year, the first of which was described in last year's report. These instruments are intended to replace two separate instruments which are essential to the operation of aircraft, thus reducing the number of instruments carried. When used as statoscopes, they indicate small changes in altitude, while when used as rate-of-climb indicators they measure the rate of change of altitude. Considerable trouble has been experienced with this type of instrument in getting a sufficiently small delayed-action relay to operate the valve in a satisfactory manner and in obtaining a suitable multiplying mechanism which will operate properly both when the instrument is used as a statoscope and when it is used as a rate-of-climb indicator, using the present sylphon diaphragm element. The second type under development is similar to the first except for the electrically-operated valve. Three instruments of this type are under construction.

Six Pitot type air-speed indicators reading to 250 mi./hr. were provided on short notice for the Bureau of Aeronautics, U. S. Navy, for use on racing planes by remodeling a number of water-ballast indicators.

Special Airship Instruments

Two electric air-speed indicators of the commutator-condenser-galvanometer type have been constructed for the U. S. Navy for use on rigid airships. These instruments are of the suspended head type, the propeller and commutator of each being mounted in a stream-lined case and suspended about 40 ft. below the ship. Considerable work was necessary to develop a stream-lined head which should be sufficiently compact and light and at the same time stable in flight. Each instrument has an extra indicator, so that the air speed can be read at two different parts of the ship simultaneously. A feature of this type of instrument is that as many indicators as desired may be connected in series to the commutator without affecting the reading which would be given by any one of them if used alone.

The need for an instrument which will give warning when the gas in one of the cells of a rigid airship has expanded to fill the cell and has begun to build up an excess pressure has led to the development of a gas-pressure alarm. The instrument is in the form of a large push button which is mounted on springs on a girder just below the gas cell and which is deflected by the lower wall of the cell when the pressure inside exceeds that of the external air. As the push button deflects, it completes an electrical circuit by closing contacts which are hermetically sealed in a sylphon diaphragm filled with carbon tetrachloride. A second sylphon connected with the first by means of a small tube serves as an expansion chamber, allowing the first sylphon to deflect under pressure. The closing of the electrical circuit operates simultaneously a buzzer and a red lamp in the cabin.

Ballonet Volume Indicator

A ballonet volume indicator of the static pressure type has been constructed. This instrument measures the difference in pressure between the gas bag and the ballonet of the ship, and so is in reality a delicate pressure gage, giving full scale deflection from a head of 1 centimeter of water. A sufficiently sensitive pressure element was obtained by using a thin color leather diaphragm with a very flexible steel spring. The leather diaphragm was treated with a special dope which made it more nearly impermeable to hydrogen and which was affected by temperatures in such a way as to compensate in part for changes of temperature of the gas and air.

The necessity for knowing the tensions in the gas bags of non-rigid airships and in the outer cover of rigid airships has brought about the development of a special tension meter for this purpose. The instrument is attached to the outside of the fabric temporarily by means of an elliptical rim containing a large number of suction holes. This rim surrounds an elliptical inner chamber into which the fabric can be deflected a known amount by an applied suction whose magnitude is measured by means of a gage attached to the instrument. If two such measurements are made at a given point of the fabric with the major axis of the instrument placed successively in directions at right angles to each other, the tensions in these directions can be computed. Furthermore, if four readings are taken with the major axis of the instrument placed successively in directions at 45 deg. with one another, it is possible to compute the magnitudes and directions of the maximum and minimum stresses.

Aircraft Compasses

A magnetic compass especially adapted for use on an airplane equipped with a turn indicator was designed and constructed for the Army Air Service. The instrument was designed so as to give quick recovery of the card after a disturbance. A Navy Mark II compass has been modified to incorporate, as far as possible without complete redesign, the results of extensive laboratory and flight tests of all types of airplane compasses.

A flight-history test is one in which the factors of time, barometric pressure, and instrument temperature are made to repeat in the laboratory the conditions of the flight. Such tests are often given the barographs carried in flights for altitude records, since by this means the most accurate determination of the altitude attained can be made. Two such altitude determinations were made by the bureau during the past year.

Governors' Meetings, A.C.C.

Pressure of important matters coming before the Aeronautical Chamber of Commerce has led the Board of Governors of that body to arrange for monthly instead of quarterly meetings.

How the Navy Was Bombed with Tomatoes

A bit of newspaper humor occasionally is refreshing. The *Evening World* of New York published on Jan. 16 the following amusing story of the chance discovery of the attacking fleet at the Panama just before the joint Army and Navy maneuvers were started, and of its bombardment with tomatoes by Army airmen.

"War was declared at 6 o'clock this morning. The 'enemy' is threatening the great Panama Canal, but this threat is forty-eight hours behind schedule time. And every time any one down here thinks of the reason for this delay he chuckles. The story is a tale of just such an accident as makes real war a thing of dramatic surprises. In this tale there figure the torrential rains of Central America, mail flights by army aviators and tomatoes.

"These rains made the ordinary mail transmission in Costa Rica impossible. The United States courteously volunteered to move the mails in modern fashion for her sister republic. Army aviators flew from Panama and took up the service, so no longer possible by ordinary means.

"On Sunday two Army planes, their mission being accomplished, started back down the Atlantic Coast. Meantime the hostile fleet, knowing only that it was to be in the vicinity of the Canal Zone, awaiting the moment of opening the sealed maneuver orders, had sailed down and sheltered itself in Chiriqui lagoon off the Panama Province of Bocas del Toro.

"In the two Army planes were Capt. A. W. Smith, one of the two qualified medical fliers of the Aviation Service, Lieut. Odas Moon, a young Texan flight commander, Lieut. Levi Beers and an enlisted man.

"Glancing down from under the clouds, Lieutenant Moon spied first one ship, and then two, then he was rubbing his eyes and wondering if he was dreaming, as he counted four battleships, three submarines, twenty-one destroyers, a whole flock of auxiliary craft and the carrier Langley, the coming of which was meant to be a deep surprise to the defenders.

"Lieutenant Moon circled around, counting up the craft. He jumped at the conclusion that the canal was about to be invaded as part of the approaching maneuvers and swooped down perilously close to the Langley.

"In his plane was a box of luscious, ripe Costa Rican tomatoes, which the officers were bringing back to their families. Suddenly the opportunity to do his country a service in a moment of 'peril' burst upon him. He proceeded to bombard the beautiful new airplane carrier with ripe tomatoes.

"He scored three direct hits, and an hour later was reporting to Maj. Follett Bradley, in command at France Field, the force and position of the hostile fleet and his successful vegetable bombardment.

"The story flew through the zone and reached military headquarters. Then it was found that Moon had spilled more than his tomatoes. For the defenders were to go scouting for the hostile fleet, once its approach was officially rumored. Moreover the size and component units of the fleet were meant to be undetermined until a successful reconnaissance was carried out.

"To make matters worse, since the enemy's location was definitely known, the obvious thing was to order out the Martin Bombers and constructively destroy it before it made a single move. All this meant the war would be over before it started.

"Generals, admirals and lesser officials knitted their brows, cogitated, debated and finally officially postponed the whole war that the 'enemy' might have time to scurry away to hide elsewhere and start from scratch.

"That is the real story of the postponement, whatever official explanations may be made, and today friend and enemy alike are grinning joyfully over the exploit of Lieutenant Moon of Texas."

Estimating Airplane Performance

N.A.C.A. Report No. 173

This paper by Walter S. Diehl, which was prepared for publication by the National Advisory Committee for Aeronautics, contains the derivation and the verification of formulae for predicting the speed range ratio, the initial rate of climb, and the absolute ceiling of an airplane. It is shown that the ratio of the maximum speed V_m to the minimum speed V_s is given by

$$\frac{V_m}{V_s} = \frac{K_1 \eta_m^{1.8}}{\left(V_s \frac{W}{HP}\right)^{1.4}}$$

where η_m is the maximum propeller efficiency and K_1 is a constant with an average value of 20.30 when V is in mi./hr. and $\frac{W}{HP}$ is in lb./bhp.

The rate of climb at sea level, C_o, is given by

$$C_o = 33000 \left(\frac{K_2 \eta_m}{\frac{W}{HP}} - \frac{(2V_s + V_m)}{1125 \left(\frac{L}{D}\right)} \right)$$

where $\left(\frac{L}{D}\right)$ is the overall value for the airplane at the angle for best climb (maximum value of $\frac{L}{D}$ is to be used) and K_2 is a constant found to be

$$K_2 = \left(\frac{V_m}{V_s}\right)^{-0.37}$$

The absolute ceiling is given indirectly by

$$\frac{HP_{as}}{HP_{rs}} = \frac{K_3 \left(\frac{L}{D}\right)}{\left(\frac{1}{\eta_m} V_s \frac{W}{HP}\right)^{0.5}}$$

K_3 having an average value of 61.7 when V_s is in mi./hr. and $\frac{W}{HP}$ is in lb./bhp. The absolute ceiling is obtained by reference to the usual curves of absolute ceiling against the ratio $\frac{HP_{as}}{HP_{rs}}$. These curves are given in N.A.C.A. Report No. 171.

Standaed formulae for service ceiling, time of climb, cruising range, and endurance are also given in the conventional forms.

A copy of Report No. 173 may be obtained upon request from the National Advisory Committee for Aeronautics, Washington, D. C.

New N.A.C.A. Member

Capt. Emory S. Land, U.S.N., has been appointed a member of the National Advisory Committee for Aeronautics by President Coolidge and has received his commission as a member of that body.

Captain Land is head of the Material Division of the Naval Bureau of Aeronautics, and is in charge of design and maintenance of naval aircraft. He has been identified with the Bureau of Aeronautics since its creation by act of Congress in 1921. Previous to this time he was on duty in London as assistant naval attaché and liaison officer with the British Air Ministry. He was appointed to the Naval Academy from Wyoming in 1898 and was graduated "with honor" in 1902, winning the sword which is presented for general excellence in athletics. In 1904 Captain Land entered the Construction Corps of the Navy and graduated from the Massachusetts Institute of Technology in 1907. During the war he served on the staff of Admiral Sims in Europe, on special submarine inspection duty. He was later a member of the Allied Armistice Commission in 1918.

Captain Land fills the vacancy on the National Advisory Committe for Aeronautics created by the recent assignment of Comdr. J. C. Hunsaker, U.S.N., to London as assistant naval attaché.

AIRPORTS AND AIRWAYS

Subcommittee Hearing on Winslow Bill

An important step toward the enactment at this session of Congress of Federal law regulating and encouraging aviation, was taken Jan 16 when Representative Samuel E Winslow, Chairman of the House Committee on Interstate and Foreign Commerce, held a meeting of a special subcommittee for preliminary consideration of H.R 3243, to create a Bureau of Civil Aeronautics in the Department of Commerce. Members of the subcommittee are: Mr. Winslow, Chairman, ex-officio; Everett Sanders, Indiana; Schuyler Merritt, Connecticut; Carl E Mapes, Michigan; Homer Hoch, Kansas; Charles F. Lea, California, and Harry B. Hawes, Missouri.

H.R. 3243 is in substance the same as H.R. 13715, known last year as the Civil Aeronautics Act of 1923, but which failed of passage.

In opening Committee consideration, Mr. Winslow said: "Representatives of the Commerce, War, Navy, Treasury, Post Office and Labor Departments, National Advisory Committee for Aeronautics, and such civilian organizations as the National Aeronautic Association, Aeronautical Chamber of Commerce, Society of Automotive Engineers and National Aircraft Underwriters Association, as well as the Aviation Committee of the American Bar Association and the Commissioners on Uniform State Laws have participated in the discussions.

"The Act, in brief, provides for the establishment in the Department of Commerce of a Bureau of Civil Aeronautics. The act is divided into five parts and establishes authority for the inspection and licensing of aircraft and pilots, establishing and certifying air routes and terminals, as well as rules of the air and their administration, and so cooperating with our military, naval, postal and commercial air activities that the whole can literally be coordinated into the air power of the United States. Aviation is, perhaps, the most significant mechanical development of this generation, contributing, as it does, to the speeding up of transportation and forming the key of our national defense on land and sea.

"In their several messages, both President Harding and President Coolidge have urged legislation for the regulation, relief, and encouragement of aviation. The establishment and development of civil aeronautics has the endorsement of the administration. The basis of air power must be a healthy, self-supporting aircraft industry. Among the needs of this industry are increased public confidence, increased capital, and more favorable insurance rates. Public confidence will expand with the increase of operating efficiency. Capital will undoubtedly enter the field as soon as our basic law governing the operation of aircraft is established upon a sound and broad basis, and under responsible management and direction and reduced hazards, reasonable insurance rates will follow."

Aero Club of Pittsburgh

The Aero Club of Pittsburgh is composed, at present, of 225 members, 80 per cent of whom are former Air Service men. The Club is incorporated under the laws of Pennsylvania.

For the first three years after its founding the Club went through the usual experiences of other Aero Clubs until that time in June, 1922, when the Government proposed the establishment of Reserve Training Fields. At that time the Club secured for Pittsburgh one of these assignments—the others being Boston, Kansas City and Los Angeles. This field, with the obligation of maintaining it for the community, was the element needed to weld the Club together into a hard working unit. After repeated efforts to interest private citizens of means in the maintenance of a flying field it was seen that the greatest success was only to be attained when the people of the community got behind the movement and considered it part of their municipal activities. To this end the Club went before the Mayor and Council of the City of Pittsburgh and the Commissioners of Allegheny County and asked that they agree to purchase and maintain, jointly, this field. The Club also suggested that it be named Rodgers Field, in honor of Calbraith Perry Rodgers, a former Pittsburgher. These recommendations were acted upon favorably and the county is now instituting condemnation proceedings to acquire the tract of land.

Upon this property the Army Air Service has already erected two steel hangars and a concrete gas house. Grading and sewerage specifications have been compiled and it is fully intended to have flying under way this summer.

Club members own some ten planes themselves, and the Club is giving a Military Ball on March 3 for the purpose of raising funds to erect its own hangar and shop facilities.

The Club is developing slowly, trying to establish each step upon a solid foundation before moving to a new problem.

The Aero Club of Pittsburgh has not been affiliated with the N.A.A. because it feels that it can accomplish more in its own community when the incentive and rewards are entirely local. While it feels that the N.A.A. is filling a long felt want and doing a real service to aeronautics, it does not agree with their system of chapters, subordinate to a central policy at Washington.

The Aero Club of Illinois

The annual meeting of the members of the Aero Club of Illinois was held Tuesday, Jan 15, 1924, in the club room, Room 132 Auditorium Hotel, Chicago. The following Officers and Directors for the year 1924 were elected:

Officers—Charles Dickinson, president; James S Stephens, 1st vice president; Dorr E. Felt, 2nd vice president; E M Laird, treasurer; Walter L. Brock, engineer.

Directors—R W Schroeder, Bion J Arnold, John T McCutcheon, Dr Francis Dickinson, Harry C Etten, William Bartholomay, Jr.

On Wednesday, Jan 16, 1924, the members of the Aero Club of Illinois enjoyed a good chicken dinner "paid for by a friend," as the invitation read. Talks by different members about their activities of the past year, also a rattling good story of a dream of twenty years hence in aviation by George ("Buck") Weaver made the evening a pleasant one.

The Aero Club of Illinois Flying Field, known as Ashburn Field, located on the southwest side of the city, Cicero Ave. and 83d St., is open the year round. Airplane storage, services and supplies can be had at all times.

Hammondsport News

Progress on work on TC ships in production at the Hammondsport plant of Airships Incorporated is most encouraging. The first ship shows signs of early completion and the first car is much admired. T L. Blakemore of Air Service Engineering has spent considerable time there lately and Lieut. Max Moyer, A S, was a recent official visitor. R. B Lefaiver, Chief Engineer, A S, is permanently attached to the factory in charge of the Air Service inspection.

The recent demonstration of the S.S. Shenandoah's ability to master a gale is an inspiration to the airship industry and Airships Incorporated are proud to have had a hand in her construction.

Valentine Prize for Miami Meet

Valentine & Co, the manufacturers of Valspar, offer a prize of $100 in cash to the winner of the Miami Chamber of Commerce Cup race, the first event of the flying meet scheduled for March 7 and 8 at Miami, Fla.

This prize will be paid without regard to the kind of varnish used on the winning plane.

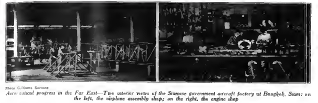

Photo C.lliams Service

Aeronautical progress in the Far East—Two interior views of the Siamese government aircraft factory at Bangkok, Siam: on the left, the airplane assembly shop; on the right, the engine shop

Admiral Fullam Recruiting N.A.A. Members

Rear Admiral W F Fullam will start a lecture tour for the N.A.A. at Miami, Fla., on Feb 4. He will later speak at Tampa, Palm Beach, Pensacola, New Orleans, Houston, San Antonio, Dallas, Fort Worth, Oklahoma City, Tulsa, Little Rock, Memphis, Birmingham, Montgomery, Atlanta, Chattanooga and Nashville. This will be his first trip and will consume about two months.

In April, it is planned to have the Admiral visit New England cities and afterward have him go to New Mexico, Arizona, California, Oregon, Washington, Idaho, Montana, North Dakota, Minnesota, Wisconsin and Michigan.

Admiral Fullam will particularly emphasize the outstanding accomplishments of the United States Air Mail Service and the results that are sure to follow development of aerial transportation, including commercial activities as well as passenger service. He will make it plain that every farmer, banker, manufacturer—in fact every business man and every family in this country—should be interested in air power for the simple reason that it will be an element of prosperity and comfort in the daily life of the nation.

In short, the Admiral's message is as follows:

"Aviation was born in the United States. The Wright Brothers of Dayton, Ohio, brought it into the world in 1903. Our Army, Navy and Post Office Departments have won every world's record in the flying game. They have triumphed amazingly and proved the vital need of air navigation in the United States. *We have more need of it than almost any other nation because of the great extent of our home territory.* Shall we now refuse to utilize and develop this new and wonderful American system of transportation, and permit all foreign nations, foreign merchants, foreign bankers, and foreign farmers to outstrip us in the practical use of the newest and greatest force that has come into the world during the past century? This is unbelievable. Every wide awake patriotic American should stop, look and listen, and put his shoulder to the wheel in support of the National Aeronautic Association in its loyal desire to protect and benefit our country, our homes, and our commercial prosperity."

Kansas Air Activities

The Aviation Engineering Co. of Lawrence, Kan, has for the past two years been successfully flying a low powered airplane called the "Sportford." This ship, which is illustrated below, is equipped with a modified Ford motor, using regular Ford head and cast iron pistons. The plane has a speed range from 25 to 60 mi/hr, and takes off and lands in much less space than a Jenny.

The firm has facilities for the production of one plane of this type per week. The production model of the engine will have aluminum pistons.

Wilber Fegley Field Is Still on Map

There seems to be a general impression that the service at Wilber Fegley Field, Kokomo, Ind., has been discontinued, due to the dissolution of the commercial aviation company which has shared the field with the 113th Observation Squadron, Air Service, Indiana National Guard. Such is not the case, as there are still five permanent duty men on service at the field 24 hr per day, ready to offer service in any form to visiting pilots. The quality of this service is well known to the many pilots who have visited the field, and will be continued.

Improvements in the government equipment are still going forward at the field, and new fire fighting equipment, in the form of a chemical truck mounted on a Ford chassis will be added to its equipment. The truck will have two 4-gal chemical tanks, and all necessary emergency equipment. With the ambulance, this will give the field emergency equipment fully as complete and of as good quality as that at many Regular Army fields.

Chicago News

By Otto Klein

J. A. Colvin has resigned his position as secretary of the Chicago chapter of the N.A.A. due to the death of his mother and his consequent departure for Florida. A new secretary will be elected at the chapter's next meeting.

The date for this meeting has been set for Feb 7. At that time a thorough discussion will be had about the Winslow Bill, as many are under the impression that it contains clauses detrimental to the welfare of those building and flying ships on a small scale. Attorney McCracken will be present to explain the points which are not understood. All local aeronautical bodies and all those interested in aeronautics have been invited to attend the meeting and join in the discussion.

Fred Hautop has sold his Standard J1 to John Miller, who has already begun to overhaul the ship at the shop of Richard Boetcher, known as the Chicago Aeronautic Laboratories.

English Light Plane Engines

A valued English correspondent of AVIATION calls attention to the fact that most of the engines used in light planes at Lympne last October were not geared. The 698 cu cm Blackburne used in the winning A.N.E.C. and Avro monoplanes were not geared, nor was the 398 cu. cm. A.B.C. in the Wren, or the 750 cu. cm Douglas engines used in the DH53's. Propellers were mounted direct and ran at about 3000 r.p.m.

The small wing racing Pixie monoplane which won the speed contest had a 750 cu cm Douglas which was geared down about 2 to 1. The Cherub engine made by the Bristol Company has not actually been used in the air. The engine which ran the 80 hr. type test was an ungeared engine, although it is understood from the Bristol Company that they are bringing out a geared model.

Flying Field at Great Bend, Kan.

Pilots in transit over Great Bend, Kan will be interested to hear that there is a flying field, known as "Spencer Northrop Flying Field," close to the northern boundary of the town. The field is equipped with a hangar for one ship and with a workshop. Ralph A. Northrop, who has maintained this field for the past three years, operates from there a Canuck and a Swallow.

Baltimore News
By W D. Tipton

Baltimore, through the efforts of the Flying Club, has made an offer to conduct this year's Jacques Schneider Cup Race, won last year for America by Lieut. David Rittenhouse. The proposal has been reviewed favorably by the Contest Committee of the National Aeronautic Association, and R. W Alexander, president of the Flying Club, in conference with Col. Frank Lahm Chairman and B Russell Shaw, vice-chairman of the Contest Committee, was advised that when the expense fund is underwritten and the Association is so advised, the preliminary sanction will be granted.

The course selected by the Flying Club is almost ideal. It is in three legs, each approximately 10 mi. long. The home station will be Bay Shore Park, a large amusement resort, about 14 mi from the city, accessible by fast electric train service and good roads. It is so arranged that large crowds can be handled and ample parking space is available. A large pier extends well out into the bay, providing an excellent point of vantage for the judges stand. The other pylons will be at Gibson Island, the home of a large country club on the Chesapeake Bay, and at Rock Hall, on the Eastern Shore which is the terminal point of the ferry which crosses the Bay.

The conference with N A A officials was held on Jan 23 and the Flying Club started immediately to prepare plans. The proposition will be put before the Mayor's Committee, which is a voluntary organization, dating back to the war, which handles all big civic events. The newspapers of the city are supporting the project wholeheartedly, and visitors will be assured of a real entertainment during their stay in Baltimore. The dates will more than likely be Friday and Saturday in either of the last two weeks in October, this late date being chosen in order to give foreign contestants more time to prepare for the race. In addition to the Schneider Race a race for civilian planes of less speed is planned for Friday and a substantial prize will be announced for this event.

Plans have been made to entirely redesign Logan Field, improvements including the erection of two steel hangars by the State for the Air Unit of the National Guard and possibly one by the Air Office of the Third Corps Area for reserve officers flying. At present the Air Unit has two Boeing type hangars and the Third Corps two. Other improvements planned include water supply, gas and oil station, radio station, shops and supply buildings. These together with the present layout of buildings including the clubhouse, hangars, shops and supply rooms will be entirely eliminated from the present position, and an entirely new development installed in the N W corner near the harbor shore. This change will considerably improve the approach to the field, allowing easier landings and takeoffs. The field will be considerably improved by grading and smoothing, and will eventually present a clear area with good approaches on all sides measuring 2100 x 1200 ft. The State will spend approximately $24,000 during the next five years.

The National Guard Air Unit is winding up its recruiting campaign since fifty men have enlisted. The prizes will be awarded as follows: the high man getting a free course in flying on one of the commercial ships at Logan Field, and the highest of the thirteen teams will get a cross country to Miller Field, the home of the New York unit, for a week end in the big city. The thirteen teams were each captained by an officer and were composed of seven enlisted men each.

W. W. Kellett Off to Europe

W. Wallace Kellett, the American representative for H. & M. Farman, returned to Europe on Feb. 6 to report conditions in the aircraft industry and to study the new types being produced in the Farman factory.

Mr. Kellett will be away several months and will visit England and several other European countries.

A 1500 hp. Aircraft Engine

According to the *Manchester Guardian*, the Italian Air Department has approved the construction of a six cylinder aircraft engine each cylinder of which will develop 250 hp. This 1500 hp. engine will be called the Stromboli.

Dayton News
By Maurice C Hutton

Eight stock De Haviland airplanes have been sent to Kelly Field, San Antonio, Tex. from Wilbur Wright Field, to replace a similar number of machines which were turned over to the Mexican government recently. It was originally planned to prepare the airplanes in Dayton for the Mexican rebel forces but the orders were never issued.

• • •

The new Army high altitude balloon and airtight cabinet was shipped last week from McCook Field to Scott Field, Belleville, Ill. The bag is constructed of a silk fabric, has a capacity of 80,000 cu. ft. and is designed to rise 80,000 ft.

• • •

Lieut Doland L. Bruner, expert night flier and head of the McCook Field electrical section, has been detailed to Langley Field, Va., to instruct the World Flight personnel in the ignition systems with which the Douglas world cruiser is equipped.

• • •

England will probably be represented in the 1924 Pulitzer race by a capable pilot and fast machine, it was reported here recently by H. W. Karr, general manager of the National Aeronautic Association, following a conference with Maj. Gen. Sir William S. Brancker, director of civil aviation in charge of racing of the Royal Aero Club of England.

• • •

Comdr Karl Smith, U. S. naval aircraft representative at the Engineering Division, announced that the Naval Bureau of Aeronautics has purchased three airplanes from the Longren Aircraft Corp. The planes were given their first flights at Topeka, Kan., by Lieut John C Kneip, of McCook Field, and declared satisfactory. Their fibre constructed fuselages showed a factor of safety of nine and a half during tests at McCook Field.

In addition to being much lighter than the ordinary airplanes, the new Longren ships are said to solve the problem of quantity production. With one set of dies it is possible to manufacture four complete airplanes a day.

• • •

Lieut John A. Macready, of McCook Field, received notification from the Contest Committee of N A A that five records made by him and Lieut. Oakley G. Kelly in the T2 last spring have been upheld by the F A I.

In a letter from B. Russell Shaw, executive vice chairman of the N. A. A., the noted flier was told that the refueling in mid-air exploits of Lieutenants Smith and Richter at Rockwell Field, Calif., have been placed in a new category by the F A I.

Preparations for Lieutenant Macready's next attempt to break the altitude record of the world are being carried on with great care. After replacing the imperfect bearing in the supercharger, following the first flight in December, a new motor was installed. Extensive ground tests made with this engine resulted in it being removed and another made ready in its place. The flight remains a matter of weeks, officers assert.

Dinner to Commander Biard

A dinner was given by the Aeronautical Chamber of Commerce on the night of Jan. 21 to Wg. Comdr. James Biard formerly of the Royal Air Force, at the Racquet Club, Washington. Commander Biard is Managing Director of the Supermarine Aircraft Works, Ltd., of Southampton, England, and is Secretary of the Society of British Aircraft Constructors.

Present at the dinner were Admiral Moffett, General Patrick, Captain Land, U S N., and Colonel Turner, U S M C., besides leading representatives of the American aircraft industry.

National Balloon Race, April 23

The definite date for the 1924 National Elimination Balloon Race has been set for April 23, 1924, and will be held at San Antonio, Tex.

The winners of first, second and third place in this contest will form the team of three contestants which will represent this country in the International Gordon Bennett Balloon Race which will be held at Brussels, Belgium, June 15, 1924.

U. S. ARMY AND NAVY AIR FORCES

U. S ARMY AIR SERVICE

Army Orders

Sec. Lieut. Arnold H. Rich, A S., Post Field, to Chanute Field on expiration of leave, for duty.

Maj. William H. Garrison, jr., A S., now Walter Reed General Hospital, to report for examination to Army retiring board under Col. Joseph H. Ford, M C.

Three months' leave to First Lieut. Ronald A. Hicks, A.S., on completion foreign service tour, with permission to return to U. S. via Suez Canal.

Capt. Robert LeG. Walsh, A.S., Bolling Field, to Office, C A S. effective Jan. 8.

First Lieut. William Turnbull, A S., Scott Field, to Walter Reed General Hospital, for observation and treatment.

Sec. Lieut. James C. Fry, 9th Inf., Fort Sam Houston, to A S. Primary Flying School, Brooks Field, for training.

First Lieut. George H. Beverley, A S., Kelly Field, to San Francisco, on expiration of leave; thence to A S., Philippine Department, Manila, transport sailing May 5.

First Lieut. Howard Z. Bogert, A S., Bolling Field, to San Francisco, on expiration two months' leave from Feb. 12, by transport sailing New York April 14, thence to A.S., Philippine Department, Manila, transport sailing May 5.

First Lieut. Harold W. Beeton, A S., Bolling Field, to San Francisco, on expiration three months' leave from Jan. 12, by transport sailing New York April 14, thence to A S., Philippine Department, Manila, transport sailing May 5.

First Lieut. John W. Benton, A S., Crissy Field, to permanent duty, that station.

First Lieut. John D. Barrigar, A S., Fort Riley, on expiration twenty-five days' leave from April 5, to San Francisco, thence to A S., Philippine Department, Manila, transport sailing May 5.

Orders Nov. 27, directing First Lieut. James Flannery, A S., sail transport leaving New York City Feb. 21 for Panama Canal Zone, amended directing Lieutenant Flannery sail transport leaving New York City Jan. 30 for same point.

First Lieut. Floyd N. Shumaker, A S., Langley Field, to duty as instructor Colorado National Guard, Denver, on expiration of leave.

Flying Time by Reserve Officers

The following table indicates flying time by Reserve officers for the month of November, 1923, at Air Service Fields.

Fields	*Hours*	*Minutes*
Chanute Field, Ill.	6	20
Crissy Field, Calif	82	30
Kelly Field, Tex.	13	55
Langley Field, Va.	5	10
Mitchel Field, N. Y.	40	5
Phillips Field, Aberdeen, Md	20	10
Rockwell Field, Calif	22	0
Selfridge Field, Mich.	35	35
Airdromes		
Boston Airport	35	5
Bowman Field, Ky. (Louisville)	32	58
Norton Field, Columbus, Ohio	29	58
Richards Field, Kansas City, Mo	57	40
Salt Lake City Airdrome, Utah	29	35
Schoen Field, Ft. Benjamin Harrison, Ind.	85	30
Total	480	26

Panama Vulnerable to Air Attack

The Panama Canal is open to attack by aircraft bombardment and raids from enemy naval forces, according to the report of the chief umpires of the recent joint maneuvers between the Blue and Black fleet of the American Navy.

The critique of the chief umpires, Admiral Coontz and Major General Hines will be sent to the War and Navy departments with recommendations. In the meantime the umpires gave out the following statement:

"The Canal is open to attack by aircraft bombardment and raids from enemy naval forces.

"It is recommended that the long-range guns on the older battleships should have an increased elevation, and the coast defenses and shore garrison here should be increased. Isthmian aircraft and anti aircraft and local naval district forces should be maintained at greater strength. As far as the Army garrison is concerned longitudinal and latitudinal roads are needed here."

136th Observation Squadron, Tenn. N. G.

There have recently been a number of changes in the commissioned personnel of the 136th Observation Squadron of the Tennessee National Guard. Lieuts. B. T. Riley and J. A. Saward have been transferred to the National Guard Reserve and Lieut. C. G. Pearcy has been discharged to accept an appointment in the Air Service of the Regular Army.

New additions to the unit are Lieuts. J. F. Outlaw and V. J. Safro, who have been federally recognized and Lieuts. S. Chester and Horkins, whose federal recognition is withheld pending their examination. In addition a new transportation officer, Jesse Zellner, succeeds 2d Lieut. N. S. McEwen, who was compelled to resign because of business reasons.

U. S. NAVAL AVIATION

Orders to Officers

Lt. Comdr. Karl F. Smith, det. Gen. Inspr. Nav. Aircraft, Central Dist. McCook Field, to Aircraft Squadrons Battle Fleet.

Lieut. Ralph A. Ofstie, det. Aircraft Squadrons Battle Fleet, to Bureau of Aeronautics, Washington.

Lieut. Ralph G. Pennoyer, det. Rec. Ship, New York, to temp. duty Bureau of Aeronautics, Washington.

CALENDAR OF AERONAUTICAL EVENTS

March 7-8	Curtiss Marine Flying Trophy Race and Flying Meet, Miami, Fla.
March 31	Closing date for papers submitted to Royal Aeronautical Society of Great Britain for the R38 Memorial Prize.
April 23.	National Balloon Race, San Antonio, Tex.
April.	Start of the World Flight of U. S. Army Air Service
	Start of U. S. Naval Arctic Air Expedition
June 3-11.	International Aircraft Exposition, Prague, Czechoslovakia.
June 15	Gordon Bennett International Balloon Race, Brussels, Belgium
June 22	Commodore Beaumont International Cup Race for high speed airplanes, Istres, France
July 5-6.	Zenith International Efficiency Contest, Paris, France.
August	"Tour de France des Avionnettes." International Round-France race for light airplanes
Oct. 2-4.	International Air Races, incl. Pulitzer Trophy Race, Dayton, Ohio.
Dec. 17.	Twenty-first anniversary of the first successful airplane flight.

Ens Daniel A. Frost, det U.S.S Seattle, to temp. duty under instr. Nav Air Sta., Pensacola, Fla

Gun. William H Hughes, det. Rec. Ship, San Francisco, to Nav Air Sta., San Diego, Calif

Gun. Frederick C Weilenmann, det. Nav Air Sta. Pensacola, to Asiatic Station

Mach Benjamin W Miffin, to Nav Air Sta, Hampton Roads, Va.

Carp Elie F Rouillon, det Nav Air Sta, Hampton Roads, to U S S Rappahannock

Scouting Plane Squadron 3 for Arctic Expedition

It has been definitely decided to use three CS2 and three SDW1 planes from Scouting Squadron Three for the Navy Arctic Air Expedition This squadron, now at the Naval Air Station at Anacostia, D C, is commanded by Lieut Comdr C P Mason.

The planes that will be used are of the long distance scouting type and are convertible for use either as seaplanes or landplanes Three planes will be assigned to the U S S Ramapo and three to the U S S Patoka, which ships will have mooring masts and will act as tenders for the Shenandoah The Patoka, to be fitted out at the Navy Yard, Norfolk, Va., will base at Spitzbergen during the expedition, the Ramapo, to be fitted out at the Navy Yard, Mare Island, Calif., will base at Nome, Alaska. The plans for the changes to be made in these vessels, including the addition of mooring masts for the airship, are nearing completion, and the actual work on them will be started in the very near future.

Salvaging a Plane in Santo Domingo

The Marine aviators at Santo Domingo City harked back to the days of Cortez when they went to salvage a wrecked plane that had landed in the wilds of the Dominican Republic on Jan. 2 On the fifth, three planes landed within two miles of the wrecked plane, and the men pushed through the jungle to the scene of the mishap

A report from Santo Domingo concerning the trip back with the salvaged parts reads as follows "This was supposed to be a salvage and wrecking expedition, but it soon turned into a tropic exploring party The Spanish *conquistadores* must have been good. The return trip through the swamp, loaded down with salvaged parts, will be long and fondly remembered by those concerned"

New Gunnery Training Plane

The first of five gunnery training planes to be known as the 'TG,' has been flown at the Naval Aircraft Factory at Philadelphia, where they are being constructed Upon completion these five planes will be sent to the Naval Air Station at Pensacola, where they will undergo service tests The completed plane is equipped with a Hall Scott engine of 180 hp and the other four, not yet ready for flight, are to be equipped with Aeromarine engines, model T6m of 200 hp

The development of this plane is another step in the evolution of suitable training types to replace the obsolete planes that have been used for training during the past five years

Metal Propellers for Service Planes

One of the most valuable lessons learned from the Navy's participation in the Pulitzer Trophy and Schneider Cup races is to be applied to service planes. The planes that won these races for the Navy were fitted with metal propellers, that added, according to estimates, about ten miles an hour to their speed. The Navy is now purchasing metal propellers for use with service types of planes, and these propellers will be tried out at the various Naval Air Stations. It is expected that the results of the service tests of these propellers will result in all service planes being equipped with them as soon as the supply of wooden propellers now in use is exhausted.

Army Lends Planes to Reserve Stations

Two landplanes of the training type have been loaned by Army Air Service Units to the Naval Reserve organizations at Boston and New York. This will facilitate the continuance of training during the winter months while seaplane operations are suspended

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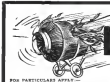

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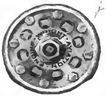

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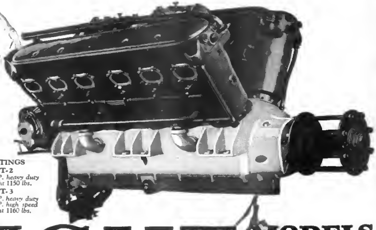

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